



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,348	02/17/2004	Rajesh K. Ahluwalia	0003/01283	9958

7590 01/26/2007
CHERSKOV & FLAYNIK
Ste 1447
The Civic Opera Building
20 North Wacker Drive
Chicago, IL 60606

EXAMINER

BOYER, RANDY

ART UNIT PAPER NUMBER

1764

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/26/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/780,348

Applicant(s)

AHLUWALIA ET AL.

Examiner

Randy Boyer

Art Unit

1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 22-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☒ Claim(s) 21 is/are objected to.
- 8) ☒ Claim(s) 1-24 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claim 21 is objected to for lack of antecedent basis.
2. Claim 21 recites the limitation "the liquid water." There is insufficient antecedent basis for this limitation in claim 21 or the claim(s) from which it depends. Appropriate correction is required.

Election/Restrictions

3. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-21, drawn to a process for rapidly heating a fuel processor and method for converting hydrocarbon fuels to a reformat gas, classified in class 423, subclass 652.
 - II. Claims 22-24, drawn to a device for the vaporization of fuel, classified in class 34, subclass 198.
4. Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another materially different process such as the vaporization of water in a steam generator.

Art Unit: 1764

5. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

6. During a telephone conversation with Michael J. Cherskov, attorney for Applicant, on January 9, 2007 a provisional election was made with traverse to prosecute the invention of I, claims 1-21. Affirmation of this election must be made by applicant in replying to this Office action. Claims 22-24 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-8, and 10-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Borup (US 6521204).

9. With respect to claim 1, Borup discloses a process for rapidly heating a fuel processor to its operating temperature, the process comprising: (a) reforming fuel with a catalyst to produce steam, carbon monoxide, and hydrogen gas (column 4, lines 7-

Art Unit: 1764

12); (b) homogenously mixing air with the carbon monoxide and hydrogen gas to create a mixture which will react and produce heat (column 4, lines 7-16); (c) using the heat to raise the temperature of catalysts in the fuel processor (column 4, lines 7-16); (d) combining the mixture with an oxidant to decrease the concentration of carbon monoxide (column 4, lines 31-37); (e) using the heat to produce steam (column 4, lines 7-21); and (f) mixing the steam with the mixture to increase the yield of hydrogen gas (column 4, lines 7-21).

10. With respect to claim 2, Borup discloses wherein a front edge of the reforming catalyst is heated to a temperature at which the fuel-air mixture ignites and generates heat which can be used for vaporization of subsequent fuel (column 4, lines 3-16).

11. With respect to claim 3, Borup discloses wherein the catalyst causes catalytic partial oxidation (column 4, lines 3-6).

12. With respect to claim 4, Borup discloses wherein the partial oxidation is of hydrocarbons with oxygen to produce carbon monoxide, hydrogen, carbon dioxide, and water (column 4, lines 7-12).

13. With respect to claim 5, Borup discloses wherein the mixture is subjected to catalyst at temperatures in the range of from about 25°C to 500°C (Figure 5).

14. With respect to claim 6, Borup discloses wherein the oxidizing agent facilitates the oxidation of hydrogen and carbon monoxide (column 4, lines 31-37).

15. With respect to claim 7, Borup provides an inherent disclosure for wherein the air-carbon monoxide-hydrogen gas mixture contains an oxygen/carbon ratio of more than one and less than 2 (columns 9 and 10, and Figure 6).

Examiner notes that Borup does not provide an explicit disclosure for wherein the gas mixture contains an oxygen/carbon ratio of more than one and less than 2.

However, Borup discloses an oxygen/carbon ratio of 10 for operation under lean conditions and an oxygen/carbon ratio of 1 for operation under rich conditions (see column 9, line 62; column 10 lines 14-22; and Figure 6).

Therefore, it follows from Borup's disclosure that in the intermediate time frame when switching from lean operation to rich operation, there will necessarily exist an operating range for which the gas mixture contains an oxygen/carbon ratio that is more than one and less than 2.

16. With respect to claim 8, Borup discloses wherein the fuel is a liquid (column 3, lines 37-38).

17. With respect to claim 10, Borup discloses wherein the air-to-fuel and steam-to-fuel ratios are adjusted to have temperatures in the reforming fuel catalyst from between about 600°C and 1000°C (column 5, lines 13-15, and Figure 3).

18. With respect to claim 11, Borup discloses wherein the maximum temperature in the reforming fuel catalyst is about 900°C (Figure 5).

19. With respect to claim 12, Borup discloses a method for converting hydrocarbon fuels to a reformat gas, the method comprising: (a) producing combustible moieties from the fuels (column 4, lines 3-6); (b) oxidizing the combustible moieties to generate heat (column 3, line 67, and column 4, lines 1-3); (c) utilizing the heat to increase the surface temperature of catalysts (column 4, lines 7-16); and (d) contacting the reactants to the catalysts (column 4, lines 7-16).

Art Unit: 1764

20. With respect to claim 13, Borup discloses wherein the step of producing combustible moieties further comprises combining the fuel with an oxidant to create a mixture (column 4, lines 3-6).

21. With respect to claim 14, Borup provides an inherent disclosure for wherein the oxygen/carbon ratio of the mixture is more than one and less than 2 (see discussion *supra* at paragraph 15).

22. With respect to claim 15, Borup discloses wherein the combustible moieties are carbon monoxide and hydrogen (column 4, lines 10-11).

23. With respect to claim 16, Borup discloses wherein the step of contacting the fuel to the catalyst results in the formation of carbon monoxide and hydrogen gas (column 4, lines 10-11).

24. With respect to claim 17, Borup discloses wherein a portion of the carbon monoxide and hydrogen is reacted with oxygen to create heat (column 4, lines 13-16).

25. With respect to claim 18, Borup discloses wherein the heat raises the temperature of a water-gas shift catalyst so the catalyst becomes active for its water-gas shift reaction which converts carbon monoxide and generates additional heat (column 4, lines 26-37).

26. With respect to claim 19, Borup discloses wherein air is injected downstream of the catalysts to have complete oxidation of all combustible moieties before the combustible moieties egress from the system (column 4, lines 33-34).

Claim Rejections - 35 USC § 103

27. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

28. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

29. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

30. Claims 9, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borup (US 6521204).

Art Unit: 1764

31. With respect to claim 9, Borup discloses a process for rapidly heating a fuel processor to its operating temperature, the process comprising: (a) reforming fuel with a catalyst to produce steam, carbon monoxide, and hydrogen gas (column 4, lines 7-12); (b) homogenously mixing air with the carbon monoxide and hydrogen gas to create a mixture which will react and produce heat (column 4, lines 7-16); (c) using the heat to raise the temperature of catalysts in the fuel processor (column 4, lines 7-16); (d) combining the mixture with an oxidant to decrease the concentration of carbon monoxide (column 4, lines 31-37); (e) using the heat to produce steam (column 4, lines 7-21); and (f) mixing the steam with the mixture to increase the yield of hydrogen gas (column 4, lines 7-21); wherein the mixture is subjected to catalyst at a temperature of from about 25°C to 500°C (Figure 5).

Borup does not disclose wherein the temperature is reached within 30 seconds.

However, Borup discloses lean start operating conditions for an autothermal reformer wherein the catalyst achieves a temperature greater than 350°C after 250 seconds and greater than 400°C after 300 seconds (Figure 4). Moreover, Borup discloses feed of the gas mixture to the reformer at a temperature greater than 100°C (column 3, lines 47-51), and explains that "minimizing start-up time is desirable" (column 7, line 51).

Therefore, it would have been obvious to the person having ordinary skill in the art at the time the invention was made to provide for operating conditions such that the gas mixture would be subjected to catalyst at a temperature of 25°C within 30 seconds.

Art Unit: 1764

32. With respect to claim 20, Borup discloses a method for converting hydrocarbon fuels to a reformat gas, the method comprising: (a) producing combustible moieties from the fuels (column 4, lines 3-6); (b) oxidizing the combustible moieties to generate heat (column 3, line 67, and column 4, lines 1-3); (c) utilizing the heat to increase the surface temperature of catalysts (column 4, lines 7-16); and (d) contacting the reactants to the catalysts (column 4, lines 7-16).

Borup does not disclose wherein liquid water is injected when the water-gas shift catalyst temperature exceeds 400°C.

However, Borup discloses a shift reactor having a high temperature shift section and a low temperature shift section (column 4, lines 26-28). Borup discloses cooling of the reformat stream occurring in between the high temperature and low temperature sections (column 4, lines 29-30). Moreover, Borup discloses a high temperature shift occurring in the range of 300°C to 600°C (column 5, lines 15-16), and a low temperature shift occurring at a temperature below 300°C (column 5, lines 16-17).

Therefore, it would have been obvious to the person having ordinary skill in the art at the time the invention was made to provide cooling of the shift reactor (e.g., by injecting liquid water) when the catalyst temperature exceeds 400°C.

33. With respect to claim 21, it is generally known in the art to provide cooling water through an injecting means (e.g., a nozzle) whereby the water is atomized into very small droplets.


Conclusion

34. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randy Boyer whose telephone number is (571) 272-7113. The examiner can normally be reached Monday through Friday from 8:00 A.M. to 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola, can be reached at (571) 272-1444. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RPB



Glenn A. Caldarola
Supervisory Patent Examiner
Technology Center 1700